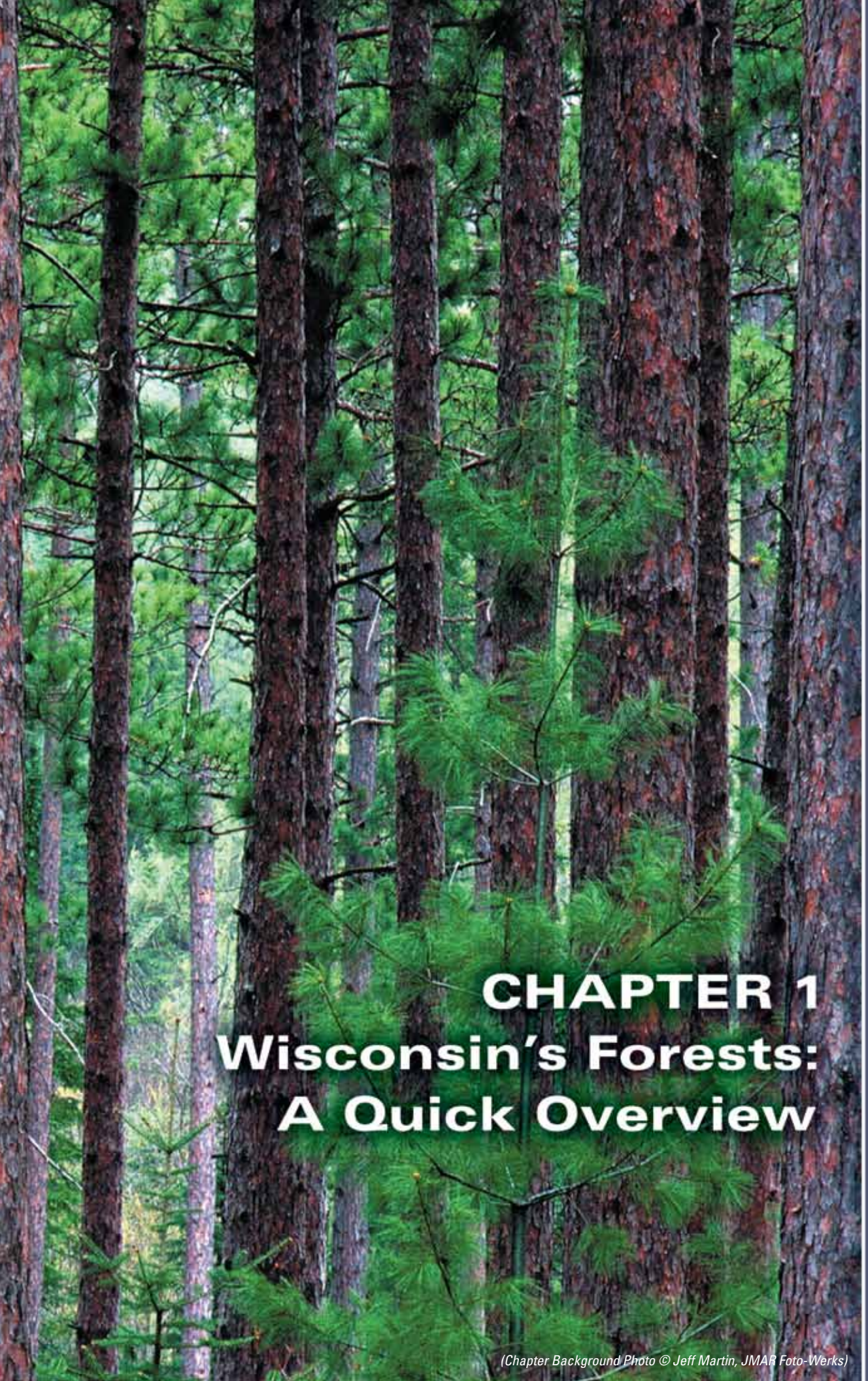

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CHAPTER 1
Wisconsin's Forests: A Quick Overview

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CHAPTER 1
WISCONSIN'S FORESTS: A QUICK OVERVIEW

A STATEWIDE SNAPSHOT OF WISCONSIN'S FORESTS*

Wisconsin's Forests

Wisconsin's forests can be divided into two broad categories, the northern mixed forest and the southern broadleaf forest. These two forest types exist in Wisconsin because they have adapted to the different soil types and climates that have supported them over thousands of years.

These two broad categories of forests meet in an area called the tension zone (see Figure 1-1). The tension zone stretches across Wisconsin from northwest to southeast in an S-shape. The tension zone forms the northern boundary of many species' ranges, both plant and animal. From Polk and St. Croix counties southeast to Milwaukee, the tension zone divides the state into two major ecological regions. The northern mixed forests are more closely related to the forests of northeastern Minnesota, northern Michigan, and southern Ontario. The southern broadleaf forests are generally considered closer, ecologically, to the forests of southern Michigan, Illinois and Indiana. The tension zone is a diverse area, where representative plant and animal species from both the northern and southern forest types can be found, as well as a significant shift in vegetation. In addition to these two broad categories of forests, the state can be divided into 16 Ecological Landscapes (see Figure 1-1) which are described in the Wisconsin DNR Ecological Landscapes Handbook.

Forest Area

Of Wisconsin's 35 million acres of land, about 16.7 million acres are forested. Forest area in Wisconsin has been steadily increasing since 1968, mostly due to the conversion of marginal agricultural land back into forests. Currently, forest covers about 48 percent of the total land area of the state. Since 1983, forestland has increased almost nine percent, or 1.3 million acres. Most of this accounted for in the northern area of the state. Forests from 61 to 100 years of age experienced the largest increase in acreage.

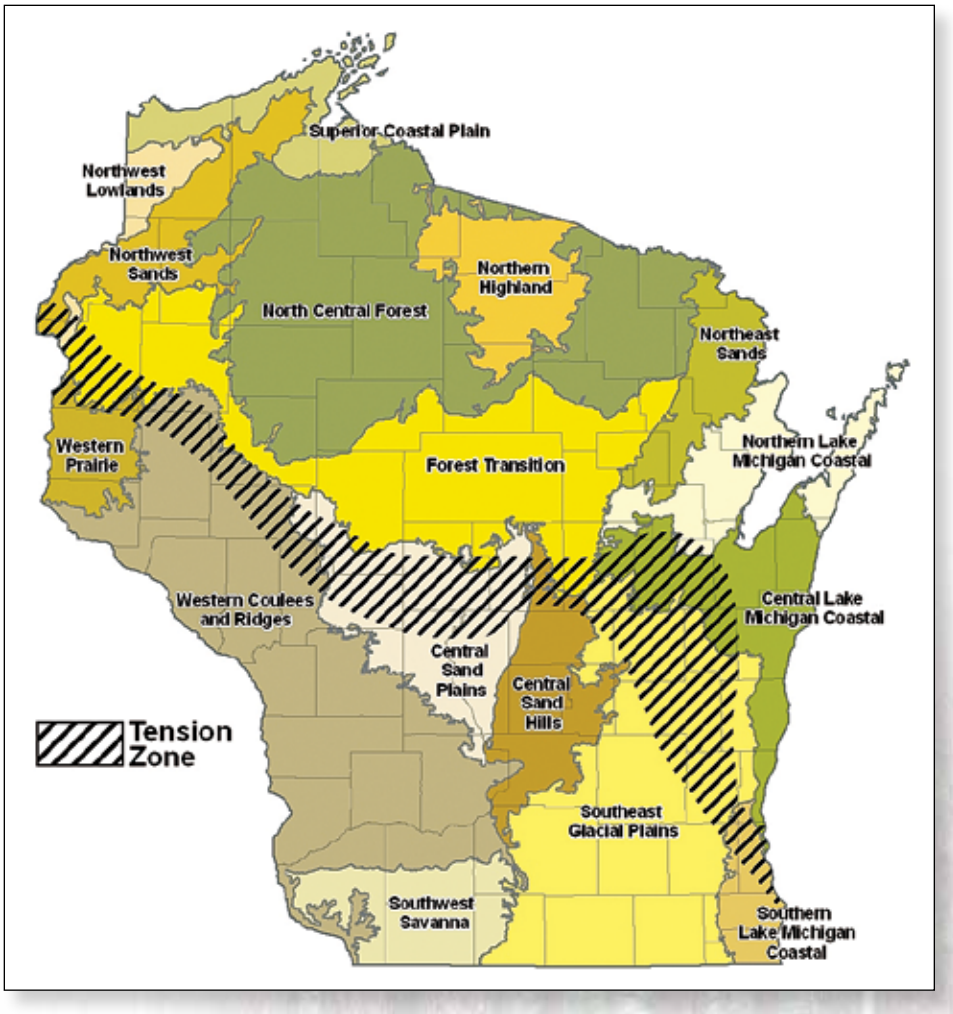


Figure 1-1: Wisconsin Tension Zone and the 16 Ecological Landscapes

* *Data and analysis in this chapter was taken from the Wisconsin's Statewide Forest Assessment, 2010. To read more about the current state and sustainability of Wisconsin's forest resources, see the assessment on the DNR web site (http://dnr.wi.gov/forestry/assessment/strategy/assess.htm).*

Forest Types

Oak-hickory, maple-basswood, and aspen-birch are the most common. Oak-hickory accounts for 4.2 million acres followed by maple-basswood forest type with 3.7 million acres, and aspen-birch forest type with almost 3.2 million acres. While 80 percent of Wisconsin's forests are hardwood types, there are also significant softwood types occupying large areas, especially in the north. Red pine, black spruce, white pine, tamarack, northern white cedar, and Jack pine are the most common types.

Areas and relative proportion of various forest types have changed significantly over the last 70 years. Hardwood succession is very apparent. Since the first official statewide forest inventory in 1936, the aspen-birch forest area has steadily decreased and the area of oak-hickory, maple-basswood, soft maple-ash and conifer forests have all increased although at different rates. The oak-hickory, maple-basswood and soft maple-ash forests have increased at a rate faster than the increase in total forestland so they now occupy a larger percent of the forested land in Wisconsin. The conifer forest has increased at the same rate as the increase in total forest land so it still occupies the same percent of the forested land in Wisconsin.

Number of Trees

Predictably, along with an increase in forest area, there has been a corresponding increase in the number of trees. Between 1996 and 2008, trees more than 10 feet tall increased by over 900 million individual trees. In 2008 there were 10.7 billion trees on timberland in Wisconsin.

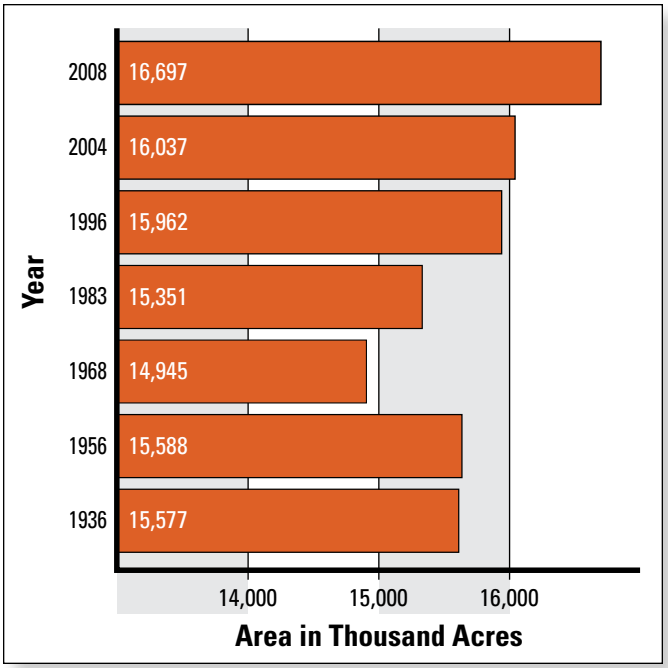


Figure 1-2: Wisconsin forest acreage over time.

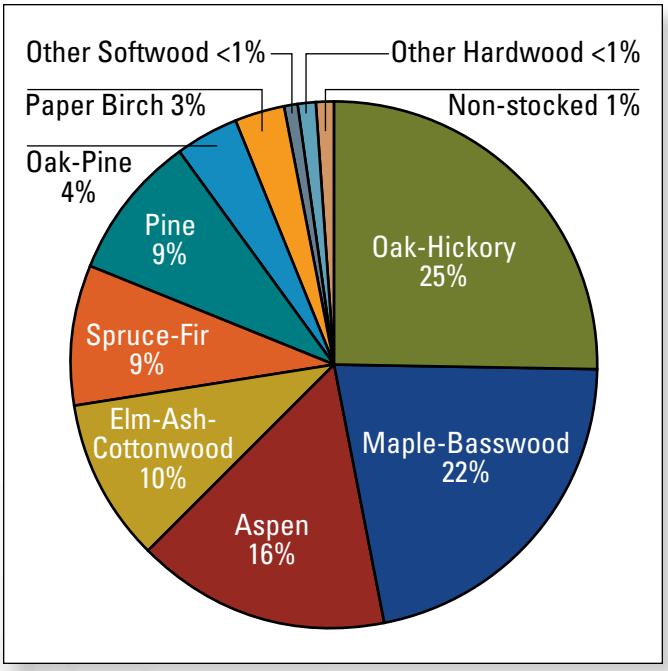
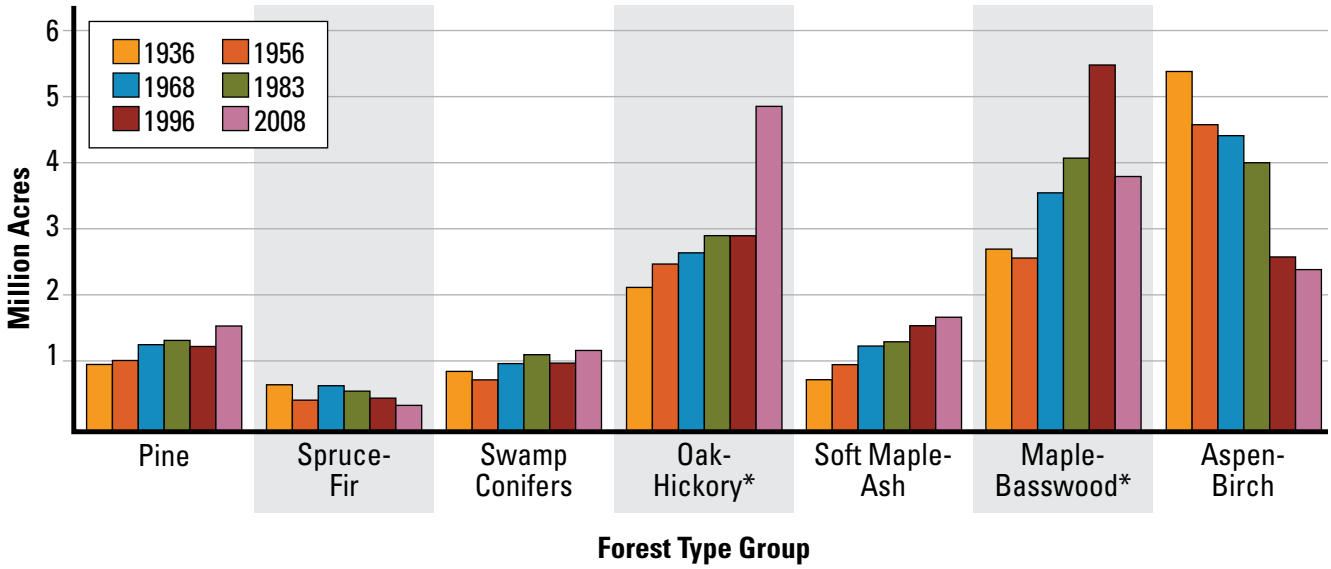


Figure 1-3: Wisconsin forest types, 2008.



** The oak-hickory and maple-basswood forest type groups are not comparable after 1996. The method for classifying forest types was changed significantly with the newest inventory. This caused much of the forest previously classified as maple-basswood to be moved into the oak-hickory forest type group.*

Figure 1-4: Wisconsin forest types over time.

Figure 1-5: The area of aspen-birch and other "pioneer types" has declined over the last 70 years. These sun-loving species require the open conditions created by a windstorm, fire or an even-aged harvest to regenerate and grow.

Timber Volume

Between the 1996 forest inventory and the 2008 forest inventory, overall growing stock volume Wisconsin timberland has increased by more than 13 percent – more than 2.4 billion cubic feet. In 2008, there were 20.9 billion cubic feet of growing stock volume, of which 5.5 billion were conifer, and 15.4 billion were hardwood. Along with this overall increase, the state's maples, oaks, basswood, ashes, white and red pines, white and black spruces, and black walnut are some of the commercially important species whose growing stock volume increased. Aspen, paper birch, jack pine, balsam fir and American Beech volumes decreased between inventories.

During the same period, sawtimber volume increased dramatically – by more than 27 percent or 13 billion board feet. Sawtimber is the largest timber size class. These trees tend to be older, more economically valuable, mature seed-producers, and are important to the forest's structure. As Wisconsin's forests age, continued growth of sawtimber volume is likely.

PLANTATIONS

About 93 percent of Wisconsin's standing forests are a result of natural regeneration. The remaining seven percent of Wisconsin's forests are plantations. In this context, plantations refer to areas established through planting that are sufficiently productive to qualify as timberland. The planted species is not necessarily dominant. The majority of plantations are conifer types and located in the central and northern parts of the state.

Figure 1-6: Most of Wisconsin's plantations are pine, however, they constitute only 4.5 percent of the state's total forestland.

Growth and Removals

In Wisconsin, our forests are growing at a rate that significantly exceeds harvest. Between 1996 and 2008, growing stock average net annual growth on timberland exceeded harvests and other removals by almost 259 million cubic feet. During the period between inventories, average net annual growth was 586 million cubic feet. Average annual removals were 327 million cubic feet, about 56 percent of average net annual growth. Between 1983 and 1996, average annual removals were 68 percent of average net annual growth. Average net annual growth of sawtimber also exceeded average annual removals, resulting in a net increase in sawtimber volume between 1996 and 2008. Each year, on average, sawtimber volume increased 2.27 billion board feet. About 42 percent of that growth was offset by removals – 949 million board feet each year. One important measure of sustainability is that the Wisconsin timber net growth exceeds removals, statewide.

Economic Importance

Wisconsin's forests provide the raw materials for homes, offices, furniture, paper, medicines, paints, plastics, and many products people may not realize come from trees. In Wisconsin, more than 1,400 wood-using companies produce over 20 billion dollars of forest products every year. More than 220,000 Wisconsin jobs rely on the forest products industry.

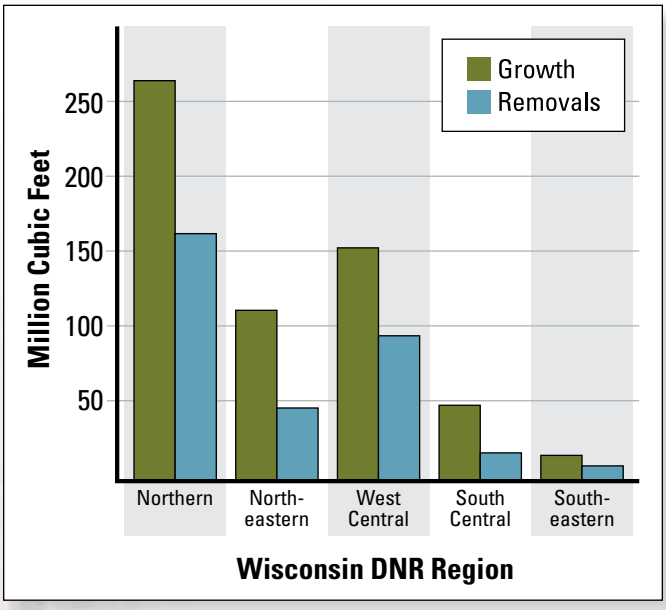


Figure 1-7: Bar graph showing growth and removal by Wisconsin DNR regions.

Carbon Storage

Rising concentrations of carbon dioxide and other greenhouse gases have been identified by scientists as contributing to the changing climate being experienced around the world today. Forests have a role in reducing the concentration of carbon dioxide in our air, slowing climate change. Through photosynthesis forests remove carbon dioxide from the atmosphere and break it down into its components of carbon and oxygen. The oxygen is released back into the atmosphere and the carbon is incorporated into roots, leaves and wood of forest plants. The amount of carbon stored in a forest depends on the tree species present, growth rate and management practices but on average an acre of forest in Wisconsin removes 1.3 tons of carbon dioxide per year from the atmosphere.

Forest Certification

Forest Certification is a market-based, non-regulatory forest conservation tool designed to recognize and promote environmentally-responsible forest management and the products that come from well-managed forests. As of 2010, more than 7.2 million acres, 44 percent of Wisconsin's private and public forest lands, have been certified by the American Tree Farm System (ATFS), Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI).

The goal of forest certification is to ensure that on-the-ground forest management meets a set of rigorous, comprehensive measures of sustainable forest management and environmental protection. Each certification system (e.g., ATFS, FSC, SFI) has developed standards that are designed to insure that forests certified under their system are managed in a way that supports the local economy, meets consumer demand for essential goods and services, protects conservation values, and insures the long-term sustainability of the resource. The system then uses these standards to evaluate an individual's or organization's forest management planning and practices. Forest land that is enrolled in a forest certification system must comply with the system's standards to remain certified. Compliance is evaluated by third-party auditors to insure that planning and management practices meet the certification system's standards and to identify opportunities for improvement.

Figure 1-8: Continued lakeshore development is influencing Wisconsin forests.

Biodiversity

Wisconsin is blessed with abundant biodiversity. Located at the junction of two of North America's biotic provinces – the Eastern Broadleaf Forest in the southern half of the state, and the Laurentian Mixed Forest in the north – we have a wealth of species and natural communities. Almost 700 species of vertebrates, well over 2,000 species of native plant taxa, numerous non-vascular plant species, over 30 lichens and tens of thousands of invertebrates are known from the state. Although not all of these organisms use forested habitats, Wisconsin forests provide important habitat for many of them. The challenge is to manage our forests while conserving Wisconsin's heritage and preserving future management options *(Wisconsin DNR Biodiversity as a Management Issue 3)*.

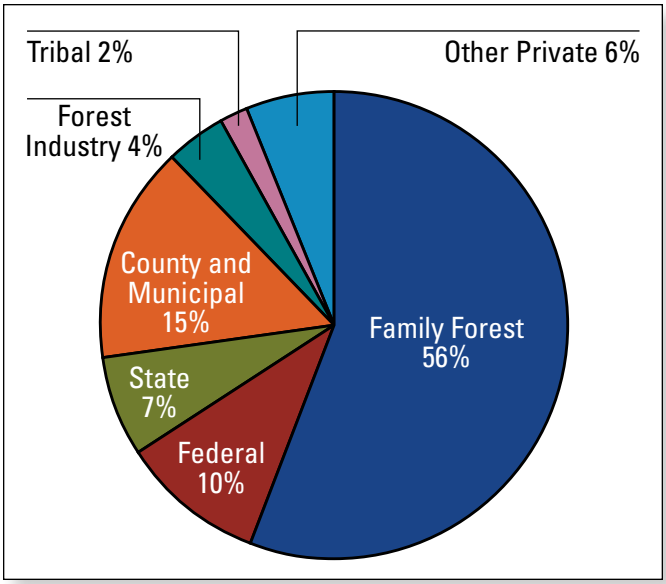


Figure 1-9: Forest acres by ownership category.

Figure 1-10: A lot for sale in Wisconsin's forestland.

Ownership

Individual, private owners own the majority of Wisconsin forests – 56 percent. The state owns just seven percent, and the federal government, 10 percent. In the public sector, counties and municipalities own the largest – 15 percent, followed by private corporations and other groups (six percent), forest industry (four percent), and tribal lands (two percent).

Ownership is increasingly important to Wisconsin forests. The demographics of Wisconsin forestland owners are changing, as are their values and goals for their land. The increase in second homes and non-resident landowners has resulted in more forest owners of smaller parcels. Lakeshore development is another trend related to this phenomenon.

This increase in second homes and non-resident landowners results in a significant increase in the number of individual private owners. Increased human presence in the forest has significant impact on the integrity of forest communities. Between 1997 and 2006, the number of Wisconsin's non-industrial private owners increased 38 percent to 362,000. Every year, an average of 9,400 new parcels are carved from Wisconsin's forestlands. As a result, ownership size is decreasing and development is increasing.

Urban Forests

Many Wisconsin residents associate with urban forests. Urban forests surround people every day. The trees, lawns, landscape plantings, gardens, urban wildlife, and people of the cities compose the urban forest ecosystem. Wisconsin has about 1.7 million acres of urban forest, about 4.7 percent of the state's total land area. Statewide, the average urban canopy cover is 29 percent of the urban area. In the northern region, urban canopy cover is closer to 38 percent, in the south it is about 26 percent.

Figure 1-11: A home on lakeshore development.

A BRIEF HISTORY OF WISCONSIN'S FORESTS

Wisconsin's forests are reservoirs of vast ecological, economic and social wealth. Throughout Wisconsin's history, forests have played a primary role in supporting people who have lived here. The forests of Wisconsin are dynamic, living systems that change with the human demands placed on them as well as through natural occurrences such as succession, severe weather events, fire, insect infestations, and disease.

Forests Before European/ American Settlement

When the last glaciers receded from northern Wisconsin between 10,000 and 12,000 years ago, a complex array of habitats supported the colonization of plants, wildlife and humans. At the time of European/ American settlement (1825 to 1880), forests stretched over most of the area that would become the state of Wisconsin. Between 22 and 30 million acres – 63 to 86 percent of the total land area of the state – were covered with forests. Two major forest divisions became apparent – the Northern Mixed Forest and the Southern Broadleaf Forest, each representing several ecosystems.

The native vegetation of the northern region is more cold-tolerant. Pine, spruce and tamarack are more abundant. Before European settlement, sugar maple, hemlock and yellow birch dominated the mesic forests of northern Wisconsin. Various pine species were also important. Aspen and white birch were important successional species that followed natural disturbance across northern Wisconsin. Acid bogs were a significant ecosystem in the northern Wisconsin forest. Pine forests and barrens were important on the sandy soils of central and northwestern Wisconsin. In the southern part of the state, oak-hickory and maple-basswood forests were especially prevalent. The southern and western parts of the state also supported oak savanna and prairie habitats. Forested and non-forested wetlands were found throughout the state (see Figure 1-13, page 1-9).

Figure 1-12: This old growth forest of pine, hemlock and northern hardwoods west of Minocqua is typical of the native vegetation that was found in northern Wisconsin before European/American settlement.

EARLY HUMAN INFLUENCE

Native people profoundly influenced the land and ecology of Wisconsin in areas where they lived. Perhaps most significant was their use of fire. It is thought that native people used fire throughout the state in varying degrees to encourage the establishment of favored plant and animal communities. Prairie and savanna were likely maintained by these fires.

Hunting and trapping also influenced the ecological communities of the area that later became Wisconsin. Native people hunted a broad spectrum of animals. Deer, fish and black bear were the cornerstone of the Woodland Indians' diet, but mussels, birds, fish, and more than 25 other mammal species were utilized as well. Many animal populations may have been limited by human hunting rather than by other carnivores or food supply.

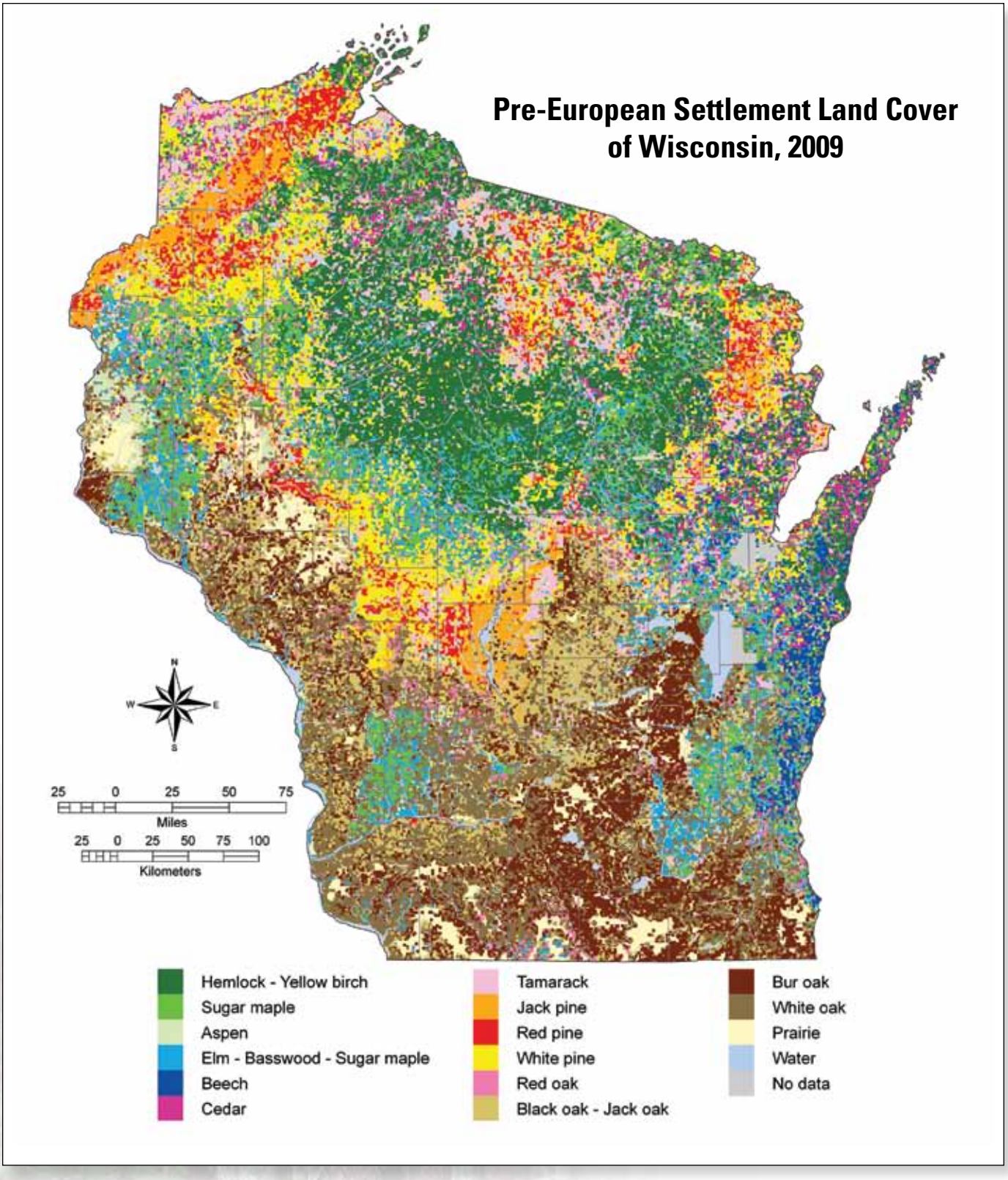


Figure 1-13: Using ecological information extracted from the U.S. General Land Office Public Land Survey records, University of Wisconsin researchers compiled a computerized, statewide tabular database of Wisconsin's 19th century vegetation. The vegetation pattern portrayed in this map is a product of the interaction among climate, soils and Native American use. Disturbances such as natural fires and windstorms were also important in shaping the forests of that time. *(Figure Credit: David J. Mladenoff, Forest Landscape Ecology Lab, University of Wisconsin-Madison, 2009)*

Figure 1-14: Prairies and savannahs were common native habitat in the southern and western parts of Wisconsin, and often maintained by the Native Americans use of fire.

Nuts and fruits were also important to native people, and there is evidence that they planted orchards to ensure a supply. There are accounts from early European explorers describing the "planted tree groves" of chestnuts, locusts, oaks, ashes, basswoods, beeches, cottonwoods, maples, pecans, medlars, mulberries, and plums. These "orchards" may have resulted in the forest islands seen on the prairies by early European explorers.

Foraging also influenced the ecology of Wisconsin. Collected plants may have become over-represented in biotic communities because of Indian dispersal. It was said of wild rice by the Menominee, "Whenever the Menomini enter a region, the wild rice spreads ahead; whenever they leave it, the wild rice passes." Mining, trails, agriculture, and placement of settlements in pre-contact times had a large impact on the landscape. Many of our major highways began as roads between native people's settlements hundreds of years ago.

When early explorers arrived in the mid-1600s, tribes living in Wisconsin included the Winnebago, Ojibwe, Menominee, Dakota, Sauk, Potawatomi, Heron, and Fox. However, some of these groups have stories of migrating from other areas to Wisconsin. For example, the Ojibwe tell of their migration from the eastern ocean in the 1400s. This era corresponds to the "Little Ice Age," a period of significant cooling of the North American continent. Temperatures between 1450 and 1850 averaged 1.5°F cooler than today.

Forests Since European/American Settlement

Today, Wisconsin's forests are significantly different than those before European/American settlement. A variety of historical reasons can account for this.

EXPLORATION AND SETTLEMENT

In 1634, Frenchman Jean Nicolet landed on the southern shore of Green Bay to arrange a truce between the Winnebago and their enemies so that the French fur trade would be protected, a task at which he succeeded. This was the first direct European influence felt on the land that would become the state of Wisconsin. However, for two hundred years, the forests remained sparsely settled while providing for the lucrative fur trade and continuing to support native people.

Various treaties in the early 1800s, which either removed or confined native populations, opened up Wisconsin to intensive European/American settlement. With the dramatic increase in human population came increasing demands on resources. Much of the southern part of the state was converted to agriculture. The fertile soil in this area, including much that was previously forested, became the base for some of the most productive farms in the growing nation. During this process, southern forests were cut and burned to aid in clearing the land and create nutrient-rich ash to fertilize crops. Timber was not a major economic contributor until the 1870s.

THE CUTOVER

In the late 1860s following the Civil War, logging became an important component of Wisconsin's economy. By 1893, Wisconsin had reached its logging zenith and was a world leader in lumber production with more than 3.5 billion board feet produced annually. Pulpwood consumption was about 211,000 cords. Sawmills sprang up everywhere along Wisconsin's many rivers, which transported logs to the mill and finished products to burgeoning cities to the south and west.

In 1898, the federal government conducted and published a survey of Wisconsin's northern forests. By this time, a first wave of cutting was well underway, and a second wave beginning. In the survey's introduction, B. E. Fernow estimates the 1850s pine (red and white pine) volume at 130 billion board feet. By 1898, all but 17 billion had been removed, and cutting was continuing at a rate of two billion board feet per year. Fernow wrote, "In almost every town in this region, logging has been carried on, and 8,000,000 of the 17,000,000 acres of forest are 'cutover' lands, largely burned-over and waste-brush lands, and one-half of it as nearly desert as it can become in the climate of Wisconsin."

By the 1930s, most of the valuable timber in the northern area of the state had been removed or destroyed by fire. The harvest occurred in two waves; the pines were harvested first and floated down the rivers to cities to the south. When railroad shipping became available, valuable hardwoods were cut and taken by train to the south. Then the other, less economically-desirable trees were cut.

Harvest techniques varied in cutover lands. Some lands were clearcut, but most were high graded. The largest and most valuable trees were removed, often leaving species and individuals less dominant to re-seed an area. At the time of the first statewide inventory in 1936, the approximately 15.5 million acres of forestland in the state was primarily young, early succession second growth.

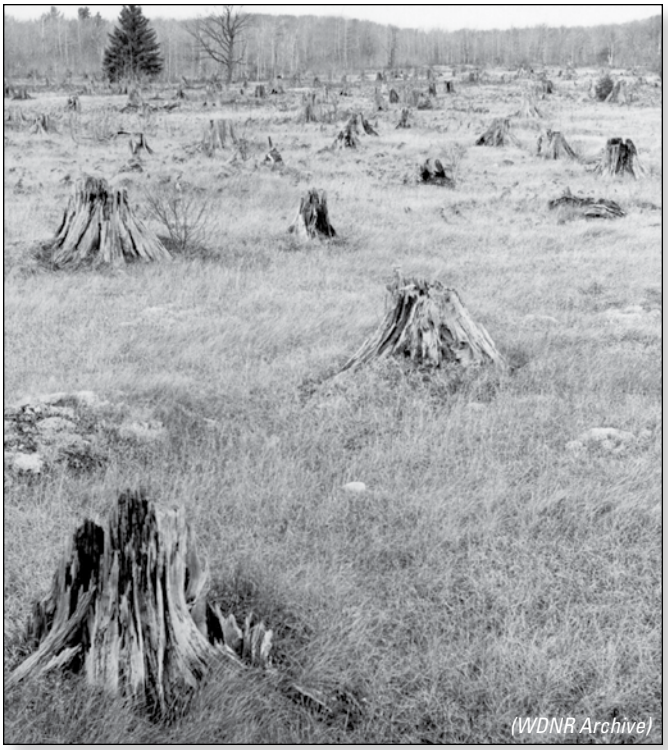


Figure 1-15: Eight million acres of forest were cut by 1898, the height of the Wisconsin Cutover.

The Cutover led to a variety of problems for contemporary and future residents. Not least among the challenges was the wave of forest fires that cinched the destruction of millions of acres of trees, and took thousands of human lives. Slash (wood residue from logging operations) burned easily and quickly. Fires spread over large areas, leaving ashes in their path.

Another result of the Cutover was the land boom of the early 1900s. In northern Wisconsin, logging companies sold sizable tracts of cutover land to speculators who then sold smaller farms to the immigrant population arriving in Wisconsin, enticed by the promise of land. Farmers diligently removed stumps left from the Cutover, sometimes disposing of them through fire, which further contributed to frequent and intense forest fires of the era.

CONSERVATION

This depletion of Wisconsin's forests did not go unnoticed. An era of forest conservation was about to begin. One of the most persistent advocates of conservation was E. M. Griffith, appointed the first state forester in 1904. With the help of people as disparate as Senator Robert LaFollette, Sr., lumber baron Frederick Weyerhaeuser, and University of Wisconsin President Charles R. Van Hise, Griffith pieced together land into state-owned forest preserves. He also oversaw construction of the first state nursery at Trout Lake near Minoqua, implemented new fire control strategies, and was influential in locating the U.S. Forest Products Laboratory in Madison.

Unfortunately, neither the public nor the Wisconsin Supreme Court was ready for such innovations. County governments were concerned about the loss of land from the tax rolls, and contended that Griffith and his cohorts were trying to turn northern Wisconsin into a "playground for the rich" at the expense of the farmers becoming established in the area.

Figure 1-16: Logjam on a river. Rivers transported much of the timber cut from Wisconsin forests in the late 1800s.

The Supreme Court found that the land was purchased for the forest preserves under the authority of an improper amendment to the state constitution. Griffith resigned in 1915, and the reforms that he tried to promote were not implemented for another decade.

Finally, in the late 1920s and 1930s, some of Griffith's goals were realized. A new concern for conservation and an understanding that the forest resource is indeed finite formed new decisions regarding Wisconsin's forests. Farmers in the north realized the land and climate were not well-suited to agriculture. Many of them abandoned the land, bankrupt. This land reverted to forest.

The State Constitution was amended in 1924 to allow state funds to go to the acquisition, development and preservation of forest resources. The Northern Highland State Forest, still the largest state forest, was the first created under the new amendment. The Forest Crop Law, a precursor to the current Managed Forest Law, was passed in 1927, making it easier for private landowners and counties to conserve forest resources for future use. County forests were created from much of the tax delinquent land of failed farms. In 1928, the first national forest land was purchased in Wisconsin, creating what is now known as the Chequamegon-Nicolet National Forest.

After 50 years of pervasive forest fires, made worse because of the ready availability of fast-burning slash from the extensive harvesting, the public began to value fire control. Human life, farms, buildings, and forests were protected with new fire prevention and control measures. With the invention of Smokey Bear in 1944, the public embraced a commitment to fire prevention and forest conservation in Wisconsin.

Figure 1-17: The Civilian Conservation Corps fought fires, planted trees and contributed in substantial ways to Wisconsin's growing conservation ethic.

In the 1930s and early 1940s, a notable influence on Wisconsin's forests was the Civilian Conservation Corps (CCC). As in other areas, the "CCC boys" fought fires, planted trees, built park buildings, and worked on other conservation projects. Reforestation efforts commenced across the state, with the goal to renew the forests. Many of Wisconsin's older pine plantations originated with CCC efforts.

The Cutover era dramatically changed the composition, structure and function of Wisconsin's forests. The extensive logging and large fires allowed species like quaking aspen and paper birch to become prevalent, encouraging large populations of whitetail deer and other wildlife that thrive in early successional habitat.

A forest inventory of Wisconsin was conducted in 1936. It revealed a very young forest, with aspen-birch by far the most prevalent forest type. Many years passed before the cutover forests recovered sufficiently for harvest. Fortunately, by this time there was a better understanding of the need to conserve forest resources and employ sound forest management. In many instances, professional foresters from forest products companies and government agencies worked together to bolster the growing forests.

Today, the state supports a wide array of forest ecosystems. Ecological, economic and social benefits have grown with the growing forest. There are also challenges that face Wisconsin's forests including environmental issues, economic demands, and changing expectations among people who use and own the forests.

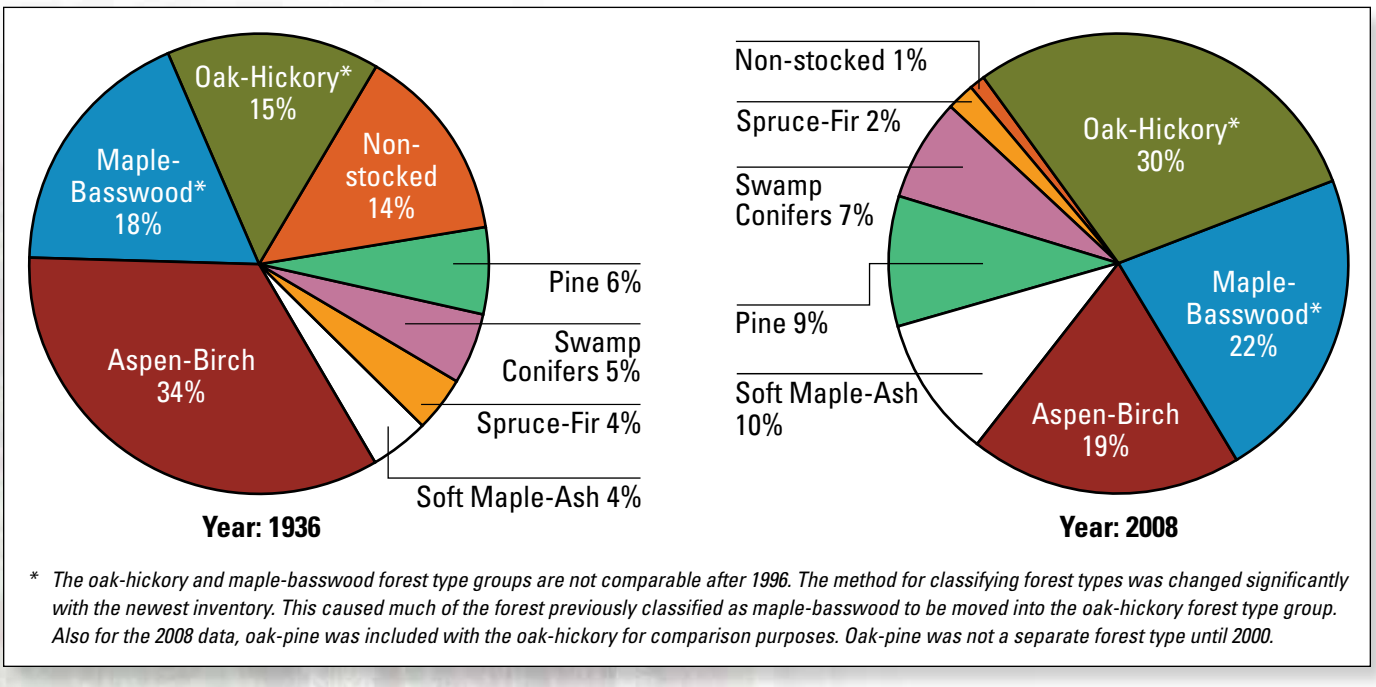


Figure 1-18: Wisconsin forest area by type in 1936 and 2008.